Acid
Deposition
Research Program

Alberta Government/Industry
Acid Deposition Research Program

April 1, 1986 to March 31, 1987

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In Perspective

What level of acid-forming emissions can the Alberta environment tolerate safely? Is the health of people being affected? Is agricultural production adversely influenced by acid-gas emissions? These are some of the important questions and concerns which continue to generate debate and a variety of answers. Environmental purists might wish that no emissions be released. Others question the billion-dollar price tag of raising Alberta's industrial recovery levels even by 0.1% from the already stringent level of 97.3%.

Who is right? What are the most practicable control measures. What may be happening to our environment?

The Acid Deposition Research Program (ADRP) is working towards establishing a sound, *scientific* basis that will help answer these questions. Through research programs such as the ADRP more knowledge will be gained on how the protection of our environment and an industrialized society can be compatible goals. This scientific information can then be used to assist in establishing both short-term and long-term environmental policies in Alberta. This scientific base will also be shared with other scientists and countries concerned with the same questions.

What are the ADRP's Priorities?

Now going into its fifth year, the ADRP is an $11-million undertaking by the Province of Alberta, the Canadian Petroleum Association, Alberta's electrical utilities and the Energy Resources Conservation Board. ADRP was formed in 1983 as the result of more than 10 years of work to study and address the environmental consequences of acid-forming gases on Alberta's environment.

The initial impetus came from APIGEC: Alberta Petroleum Industry, Government Environmental Committee which subsequently formed SCAGE: the Steering Committee on Acid Gases in the Environment in 1979.

SCAGE reviewed existing information on acid-forming emissions, determined the extent of knowledge deficiencies, recommended research projects, and emphasized the importance of developing an ecological monitoring strategy. The ADRP was formed in 1983 on this foundation, and proceeded to define research priorities more clearly with the input of the international scientific community, industry, government, and the public.

The ADRP's research programs were designed and continue to be carefully monitored and guided by two internationally recognized groups of scientists: one in human health and the other specializing in air, land and water systems. These impartial Scientific Advisory Boards directed the ADRP to two principal gas groups – oxides of sulphur (SO_x) and oxides of nitrogen (NO_x) – with respect to the environment or biophysical areas. In addition, in the area of human health, they recommended a controlled medical diagnostic review, now complete, to address the health concerns of residents in a southwestern Alberta community living in the proximity of a sour gas plant.

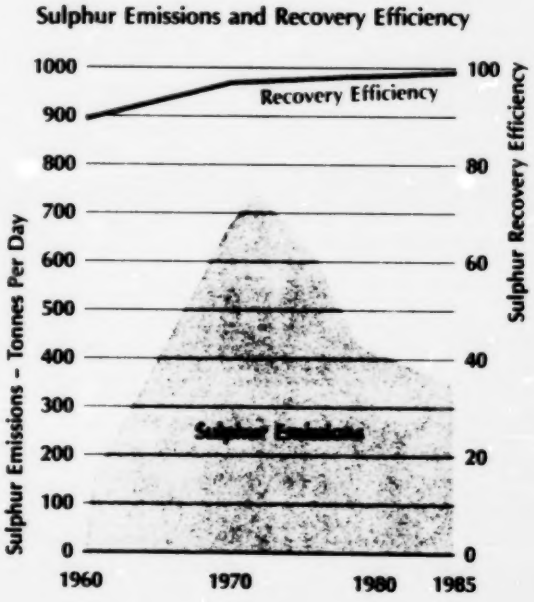
This unique integration of scientific expertise in the biophysical and human health areas is a distinctive feature of the ADRP. The basic assumption behind this approach is that all components of ecosystems are interrelated. Thus, it is only by understanding the processes within, between, and among the human and biological systems that researchers can hope to fully assess the impacts of acid deposition.

The ADRP is now working toward the biophysical research Critical Point I, which is expected to be completed by August 1988. Critical Point I is the stage at which the ADRP and its scientific advisors will look at the first-phase research findings and determine what type of further research, if any, is required.

World-wide the processing and burning of fossil fuels produces sulphur and nitrogen oxide by-products. In the atmosphere sulphur dioxide and nitrogen oxides are transformed chemically to sulphuric acid and nitric acid. These two acids can fall to earth as wet depositions in rain, snow, sleet or hail. Through another process, dry deposition, these oxides fall to the earth and can combine with surface moisture to form acids. (Acid deposition is a broader term than acid rain, but the two are often used day-to-day interchangeably.) The key question researchers are investigating is what environmental change do the current atmospheric levels have.

In Alberta, the major sources of sulphur oxides are natural gas processing and oil sands plants and coal-fired power plants. These are primary industries in Alberta and integral to the province's economic structure. The major sources of nitrogen oxides are industrial processing, motor vehicles, and the burning of natural gas to heat our homes and offices.

Alberta's industrial operations related to oil and gas, coal, and utilities are governed by regulations which are among the world's most stringent, and the accompanying graph shows that sulphur dioxide emissions have been reduced significantly over the past years. Yet, industry and government are continuing to take a pro-active approach with respect to acid-forming gases. The scientific base provided by programs such as the ADRP will further foster sound environmental management in Alberta.



This graph, provided by the Energy Resources Conservation Board shows the reduced levels of sulphur emissions in Alberta within the last decade.

Acid Deposition Research Program

Objectives

1. To provide a comprehensive understanding of the effects and consequences of acid-forming gases on the environment.

2. To provide a scientific basis for sound, long-term environmental management and regulatory control with respect to acid-forming gases.

3. To disseminate such information among members, to the public and to government bodies.

4. To undertake any research deemed appropriate.

5. To encourage and include opportunities for public representation in the ADRP.

Membership and Percentage Participation

Members	Percentage Participation for Voting and Funding
The Minister of Environment	50.00
Canadian Petroleum Association	34.60
Energy Resources Conservation Board	10.00
Utilities Group	5.40
- TransAlta Utilities Corporation	
- Alberta Power Limited	
- The City of Edmonton	
Public Member	—
TOTAL	**100.00%**

Members Committee Representatives 1986-87

R.L. Findlay (Co-Chairman)
Manager, Environmental Affairs and Safety
AMOCO Canada Petroleum Co. Ltd.
Canadian Petroleum Association

C. Primus (Co-Chairman)
Assistant Deputy Minister
Alberta Environment

Ken Smith (Treasurer)
Assistant Deputy Minister
Alberta Environment

Dr. Harby S. Sandhu (Secretary)
Senior Research Manager
Research Management Division
Alberta Environment

Cornelis (Casey) G. Van Teeling (Acting Secretary)
Senior Manager
Administration and Program Planning
Research Management Division
Alberta Environment

Ed Brushett
Manager, Environment Protection
Energy Resources Conservation Board

Dr. John Railton
Manager, Reclamation Planning
TransAlta Utilities Corporation

Millard Wright
Manager, Environmental Planning
Gulf Canada Resources

Dr. Brian O'Connor
Director of Health Promotion and Protection Programs
Alberta Community and Occupational Health

Dr. Martha Kostuch
Public Representative

Program Manager: Dr. Ron Wallace

Communications Co-ordinator: Jean L. Andryiszyn

Assistant Communications: Susan N. Frommert

Members' Committee Report

Of major significance for the Acid Deposition Research Program in the 1986-87 fiscal year was the confirmation of the soundness of our approach to research and our commitment to problem-solving in a scientifically-credible and publicly-accountable manner. In addition to our other research programs, this year we fulfilled our mandate with respect to the Southwest Alberta Medical Diagnostic Review (MDR). The MDR is one of the largest clinical and environmental epidemiology (community health) studies ever conducted in Canada. It was a rigorous test of the ADRP's approach. From the time of the Request for Proposal to the announcement of results to the public less than two years passed.

The MDR presented the state of health of two Alberta communities co-existing near gas facilities and another community outside the area of such activity. Addressing the study's main objective, this review thankfully allowed researchers to reassure residents near the southwest Alberta community of Pincher Creek that their community, by any Canadian standard, is healthy. As a secondary benefit, the health status of the study's comparison communities was established, and also identified "healthy" communities.

The experience with the MDR was invaluable, and from it the Members Committee has gained an awareness and appreciation that credible research requires a concerted and conscious adherence to some major principles. These principles were integral to the MDR:

- A Scientific Advisory Board (SAB), a body of internationally-respected medical and health science professionals, provided planning expertise, guidance, direction and evaluation of all aspects of the scientific work. Under the Chairmanship of Dr. Benjamin Burrows, Professor of Internal Medicine and Director of Respiratory Sciences at the University of Arizona, the SAB ensured that all research was carried out with the outmost consideration to scientific credibility. The SAB also reviewed the final product with meticulous scientific convention. Only after all the independent SAB members were fully satisfied was the MDR report released.

- The research team, the McGill Inter-University Research Group, drew on the expertise of top-calibre scientists throughout Canada and internationally. It further assembled a Scientific Advisory Group, made up of top medical scientists who provided their own independent report on the MDR to the Dean of Medicine, McGill University.

- The MDR experience demonstrated that diverse and exceptional resources exist that can be brought together, especially for complex issues. When groups such as the ADRP foster a working atmosphere based on scientific integrity and commitment to scientific excellence, the end-product is research that greatly expands our knowledge and can be used to solve problems.

• In all areas included in the MDR study, the community was an essential part of the process. The community was informed of all aspects of research and contributed to the research process itself by providing input on matters of relevance and assisting with participation and with logistics. The newsmedia were also extremely co-operative and they were provided with timely information and had ready access to the investigators. In all respects, the research was conducted in an atmosphere of openness and public accountability.

The ADRP will continue to approach all of its research adhering to the principles that were so effective in the MDR.

Other Highlights 1986-87

While detailed reports follow on research initiatives by the ADRP, among the other highlights of the past fiscal year are:

■ In the **biophysical research program,** work continued toward achievement of Critical Point I. A significant aspect of the ADRP's biophysical program, the world literature reviews on the effects of acidic deposition, were completed and the Scientific Advisory Board conducted its peer review of the 11-volume work. Publication of the reports and plans for their public release are now underway. The information from the literature reviews and the data which will be available from our field studies will be applied then to the Alberta context.

Also in the biophysical program, an inventory of sulphur oxide and nitrogen oxide emissions in Alberta has been completed by the researchers, and will be provided to the Scientific Advisory Board for peer review early in the 1987-88 fiscal year.

The ADRP's Members Committee also accepted the recommendation of The University of Calgary Kananaskis Centre for Environmental Research, the prime research contractor, that Critical Point I be extended to September 1988 to allow for an increased air quality monitoring base.

■ In the **occupational health area** a feasibility study related to the occupational exposure of sweet gas, sour gas, and thermal plant workers in Alberta was completed by the Department of Health Services Administration and Community Medicine, Faculty of Medicine, University of Alberta. The researchers concluded that enough data exists to do cost-effective research. The ADRP has completed a technical review of the study and will be determining research direction in 1987.

■ **Communications** continued to be an important part of the ADRP's work, and during this fiscal year particular emphasis was placed on providing Albertans with the results of the MDR, and an opportunity to speak to the researchers and ask questions about the research.

Communications programs related to the MDR won two major awards this fiscal year for our Communications Co-ordinator Jean Andryiszyn: the top local award from the Calgary Chapter of the Canadian Public Relations Society (CPRS) and a national award from the CPRS.

Also during this fiscal year, an independent study was commissioned by the ADRP to look at the structure of the Public Advisory Board with the aim of strengthening the PAB's role and clarifying its terms of reference and mandate.

A readership survey also was completed to assist the ADRP in ensuring that the information we are providing our readers is useful and meets their needs.

A Commitment to Excellence

Literally hundreds of individuals have taken the ADRP from a concept to a world-class research program that, in less than four years, has published its first findings. We must credit the commitment to excellence of our research teams, our technical committees, our Scientific Advisory Boards, our Public Advisory Board and Community Advisory Group. Our progress is the result of the combined efforts of internationally-respected scientists and concerned citizens.

We also extend our thanks to the ADRP's staff: Program Manager Dr. Ron Wallace; Administrator Laura White of the Canadian Petro-

leum Association; Communications Co-ordinator Jean Andryiszyn and her assistant Susan Frommert.

Our sincere thanks must also go to Carl Primus, who for much of the 1986-87 fiscal year was Government Co-Chairman of the ADRP. Despite his transfer to a new area of responsibility, we know he will watch our progress over the coming years.

The ADRP's Members Committee represents the financial sponsors of this ambitious research program. Alberta Environment, the Canadian Petroleum Association, Alberta's utilities and the Energy Resources Conservation Board have not only made a long-term financial commitment, but these organizations stand behind the principles inherent in sound, credible scientific research. In addition, Alberta Community and Occupational Health committed significant financial resources to conduct the "blue-ribbon" MDR study.

Despite difficult economic times being faced by the Alberta oil and gas industry and the Province, the financial sponsors of the ADRP are convinced that work must proceed in establishing a scientific basis for sound, long-term environmental management and regulatory control of acid-forming gases.

The Members Committee and staff of the Acid Deposition Research Program: (left to right, front row) Dr. Ron Wallace, Program Manager; Ron Findlay, Industry Co-chairman; Ken Smith, Government Co-chairman; Dr. John Railton, Utilities; (back row) Dr. Brian O'Connor, Occupational Health; Casey Van Teeling , Acting Secretary; Jean Andryiszyn, Communications Co-ordinator; Ed Brushett, Energy Resources Conservation Board; and Perry Sims, Government Representative.

Looking Ahead

The 1987-88 fiscal year will bring the ADRP within months of extended Critical Point I in its biophysical research. Critical Point I will identify whether there is a need for, and if so, the nature of future research. Many resources are needed to ensure that this research continues on schedule and within budget. Research results from the world literature reviews and the air quality monitoring will require communications programs to convey this information to interested Albertans.

The coming fiscal year brings the challenges of a research program that promises to expand our knowledge base on the questions of acid deposition in Alberta.

On Behalf of the Members Committee

K. L. Smith

Ken Smith, Co-Chairman
Assistant Deputy Minister,
Alberta Environment

Ron L. Findlay

Ron Findlay, Co-Chairman
Canadian Petroleum Association

Special Report – Biophysical Research

During the 1986-87 fiscal year, one of the significant decisions made by the ADRP Members Committee with respect to the biophysical research program was to approve the recommendation of the prime research contractor to extend the initial phase of the program. This extension will allow for an increased air quality monitoring base, and thus provide a more representative and internationally-acceptable measure of the air quality at the three sampling locations in Alberta.

The ADRP's Biophysical Scientific Advisory Board, which has been reviewing and advising on all aspects of the science, agreed with the recommendation.

The extension of Critical Point I requires approximately an additional $1.8 million. The original value of the contract, signed with the Kananaskis Centre in January, 1985, was $2.9 million for a 32-month period.

Specifically the objectives of the biophysical research program to Critical Point I include:

1. an initial assessment of the potential impact of acid-forming gases on Alberta's environment, including local and regional air quality assessments and agricultural crops and soils evaluation;
2. an inventory of sulphur oxide and nitrogen oxide emissions in Alberta;
3. a world literature review in the biological sciences on the effects of acid deposition on vegetation, soils and surface and ground waters, and then placing these in an Alberta context.

While working towards achievement of the first objective continues, work related to objectives two and three is nearing completion. The inventory of emissions was completed and the report on this inventory will be provided to the ADRP's Scientific Advisory Board for peer review. The world literature reviews have already undergone peer review, and the 11-volume set is now being printed in preparation for public release in the 1987-88 fiscal year. Plans are also being made for a technical workshop in the fall of 1987 to allow the Scientific Advisory Board and the researchers to discuss their findings related to the air inventory and world literature reviews.

ADRP: Biophysical Research Program to Critical Point 1

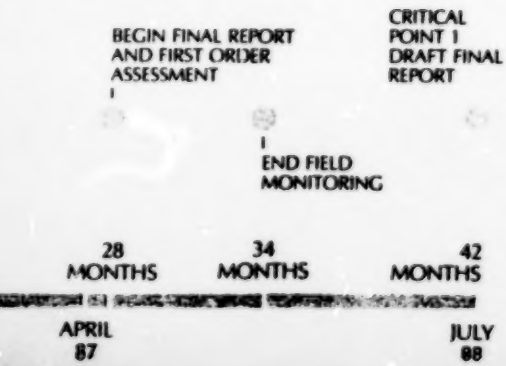
This simplified time line shows the progress to the end of fiscal year March 31, 1987.

The Biophysical Research Team

The biophysical research contract was awarded in January, 1985 to a university/private sector team headed by the Kananaskis Centre for Environmental Research of the University of Calgary. The Principal Investigator is Dr. Allan Legge.

The research contract involves more than 50 professional and technical people. In addition to the resources of the Kananaskis Centre, the scientific expertise of individuals from these organizations and companies has been retained to assist the ADRP:

- The University of Calgary, Departments of Physics, Biology and Mathematics and Statistics;
- Ecosat Geobotanical Surveys Inc. Vancouver, British Columbia;
- Campbell Geoscience Ltd., Calgary, Alberta;
- Western Research, a division of Bow Valley Resource Services Ltd., Calgary, Alberta;
- Soils Department, Alberta Research Council;
- Nuclear Environment Analysis Corp; Beaverton, Oregon;
- Element Analysis Corporation, Tallahassee, Florida;
- Lawrence Livermore Laboratory, University of California, Livermore, California; and
- University of Minnesota, Department of Plant Pathology.



1 Dr. Allan Legge, principal investigator for the ADRP's biophysical research program.

The Complexities of Air Quality Monitoring Data

The question the Acid Deposition Research Program is working towards answering appears relatively simple: what is the likelihood that acid-forming gases are, or will, cause a problem in Alberta. The process of reaching the answer, however, is extremely complex.

The air quality monitoring work is an essential part of the ADRP's high calibre research. The air quality work is unique, from a number of perspectives: 1. volume of data involved; 2. the number of parameters being studied; and 3. the quality of information that is required.

The air monitoring data is being obtained continuously from three Alberta sites: Fortress Mountain to determine the quality of air entering the province, and two sites north of Calgary near Crossfield. The Crossfield sites provide researchers an opportunity to analyze the chemical composition of Calgary's urban plume, Highway 2 north, and local and regional industrial emissions.

According to researcher Martin Hansen, who is with Western Research of Calgary and is one of the team members working with the Kananaskis Centre in the air monitoring work, at each of the sites approximately 100 parameters are being measured continuously and resultant data averaged and stored every two minutes by a computer. This translates into 26,280,000 individual numbers being generated annually from **each** of the three monitoring sites (or 3,000 numbers per hour.) Hansen compares this volume with that of a standard air quality monitoring trailer at the site of an industrial plant which would produce four numbers per hour or 35,040 numbers annually. Each ADRP site generates 750 times more data.

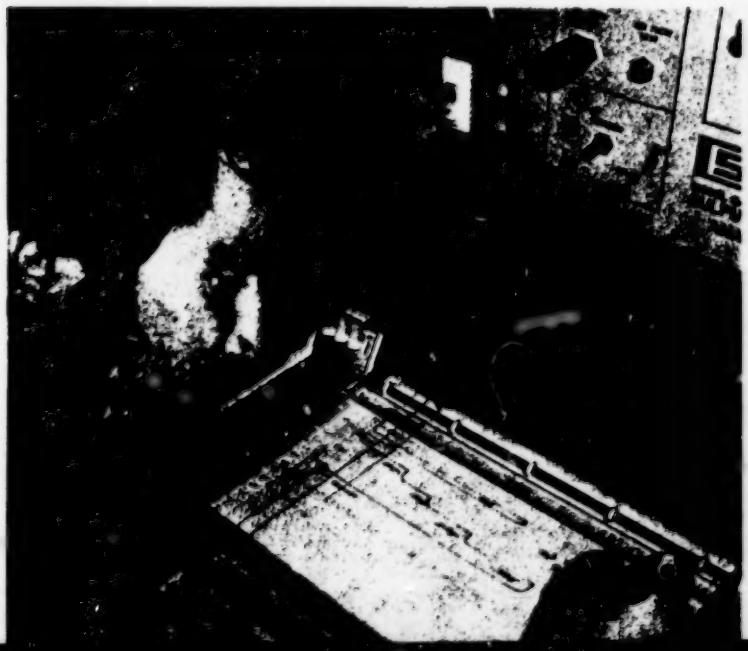
The air monitoring equipment went into operation in the summer of 1985 and since that time

1

Technician Kevin Warren carrying out a multi-point calibration as part of the quality control measures for the ADRP's air monitoring program.

2

Technician Gary Cross replacing a Kananaskis Atmospheric Pollution Sampler (KAP Sampler) at the Fortress Mountain monitoring station. The KAP Sampler, technology arising from the ADRP program, provides a comprehensive collection system that gives a more precise view of what chemicals are in our atmosphere.



and until October 1988 will be measuring parameters in three basic categories:

1. air pollutants, such as SO_2, H_2S, O_3 (ozone) NO_x, NO, NO_2,CO, and CO_2;

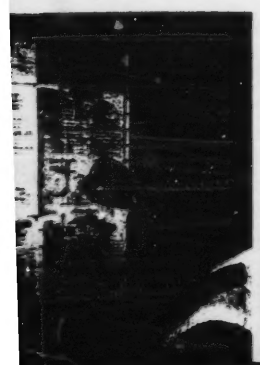
2. meteorological parameters, which include wind speed and direction, ambient temperature, solar radiation and precipitation; and

3. equipment performance parameters, while not specific to the scientific analysis, these quality control measures ensure that the instruments are working properly at all times.

As the computer and monitoring systems are being used to their optimum, an obvious concern of the researchers, in addition to the sheer logistical problems, is to ensure that all data is of high quality.

Hansen explains that quality is ensured in two main ways. First, researchers check daily on the sophisticated equipment to ensure proper operation and that the data being collected appears reasonable. All the air quality equipment is subject to regular, rigorous calibrations. Second, when data are retrieved from the field computer, Western's researchers validate the quality through rigorous detailed inspection. Data resulting from improper instrument performance are isolated and flagged as invalid before archive files are generated and provided to the University of Calgary Department of Mathematics and Statistics.

Before Critical Point I is reached, the data will then undergo two types of analysis. Western Research and The Kananaskis Centre, working with the U of C's Department of Mathematics and Statistics, will analyze the data from an air quality and meteorological standpoint. Information from both analyses will be used to answer the ADRP's main question.



3
The Fortress Mountain air monitoring station.

4
Technician Ben Kucewicz evaluates air quality computer printouts.

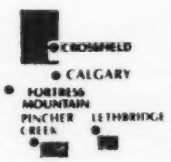
5
Research Assistant Brian Fong working with Kananaskis Atmospheric Pollution Sampler data.

6
Maintenance of atmospheric sulphur analyzer by technician Gary Cross.

Sites of Biophysical Research and Human Health Research

MEDICAL DIAGNOSTIC REVIEW

BIOPHYSICAL RESEARCH



Biophysical

The research work at the Crossfield sites will include local and regional air quality assessments and agricultural crops and soils evaluation with respect to acidic deposition. The Fortress site is used as a "background" or comparison area, to determine the quality of air entering Alberta.

The Scientific Advisory Board approved the Crossfield site for this work for a number of important reasons:

1. The proximity to the large urban centre of Calgary, the major transportation corridor of Highway 2 north, local and regional industrial emissions and appropriate wind patterns, were key factors leading to Crossfield's selection.

2. At this site the researchers will be able to evaluate sulphur dioxide, hydrogen sulphide, hydrocarbons, oxides of nitrogen, ozone, carbon dioxide and trace metals. This evaluation will help researchers integrate ADRP's biophysical and health research programs by describing and quantifying the chemical nature of the atmosphere in Southern Alberta.

Human Health

The main study area, or Index Area, for the Medical Diagnostic Review (see report which follows) included several communities near Pincher Creek, Alberta. An area southeast of Lethbridge, including Stirling/Raymond and an area northwest of Calgary including Crossfield served as comparison communities in this major community health study.

Special Report – Human Health Medical Diagnostic Review

In the 1986-87 year, the ADRP concluded its mandate with respect to the $3.7 million Southwest Alberta Medical Diagnostic Review. This mandate included the management and financial administration of the study, as well as the community relations program.

The ADRP's Scientific Advisory Board (SAB) was responsible for all scientific aspects related to the study, including a peer review which concurred with the MDR's conclusions. In its review the SAB commended the ADRP and the Government of Alberta, which funded the study through the Department of Community and Occupational Health, for their willingness to support an inherently complex and expensive study in response to the health concerns in a relatively small area within the province. "We are impressed with the care that was taken to prevent any outside pressures from influencing either the conduct of the MDR or the process of its review."

Results of this study, one of the largest community health studies conducted in Canada, were provided to Albertans in June, 1986. Following in this annual report, in the special report related to ADRP's communications, the extensive community relations activities related to providing Albertans with the results are outlined.

An Overview of MDR Results

The Medical Diagnostic Review's prime research contractor, headed by Dr. Walter Spitzer, was the McGill Inter-University Research Group. The researchers set out to answer whether the people living in the proximity of a sour gas plant in the Index Area (residents of the southwestern Alberta communities of Twin Butte, Hill Spring, Mountain View, Glenwood and Willow Creek) have a different health status or experience than the most comparable and **unexposed** population within Alberta. The best reference or control population proved to be the residents in the Stirling/Raymond (SR) area, south of Lethbridge. Comparisons with samples of an **exposed** comparison community of Didsbury/Carstairs/Crossfield/Irricana (DCCI) north of Calgary, and of Stirling/Raymond excluding Mormon residents (SR-M) assisted the investigators in interpretation and corroboration of the contrasts. Comparisons with other samples of Alberta and Canadian populations were also made.

While the study did **not** explore, nor was it meant to explore, cause/effect in relation to sour gas emissions, it had, as its main research question, to determine whether there exists a possible "epidemic" of adverse health as identified by some residents in the Index Area. Long-standing health concerns have been held by some residents of the Index Area, and prior to this research being undertaken, an ADRP-sponsored workshop was held and included an international group of scientists specializing in human health and the environment as well as residents of the area.

The overall conclusion reached by the McGill Inter-University Research Group concerning the health of Index Area residents was announced by the investigators at community meetings in Pincher Creek, Crossfield and Stirling:

The greatest concerns of the population in the Index Area were about excess mortality, high rates of cancer, diminished respiratory function, dangerous levels of trace metals in the body, higher rates of unfavorable reproductive outcomes and birth defects, and delayed or abnormal childhood development. For all the foregoing concerns we have not detected objective evidence to perpetuate the concerns. We are confident of the scientific basis of that reassurance.

With respect to symptoms or how people feel concerning possible contamination of their environment, there is a small difference suggesting greater concern and more awareness of one's health and one's sensations among residents in the Index Area. That is entirely understandable and indeed expected given a quarter century of equivocal information about health in relation to the immediate environment which has been diffused in Southern Alberta.

The investigators took exhaustive measures to ensure the scientific certainty of their work. This among other measures involved thorough scientific scrutiny of the research and analysis by some of the world's leading epidemiologists, environmental scientists, chemists, toxicologists and clinical investigators from such centres as Yale, Harvard, Cambridge, Johns Hopkins University, the University of Rochester and the University of Arizona.

The field work, conducted in the summer of 1985, involved more than 100 medical, technical and support staff from more than seven Canadian universities, co-ordinated by McGill. More than 3,600 Albertans were involved in a four-hour series of health examinations including two medical exams, questionnaires, blood, urine and hair samples, electrocardiograms and spirometry tests. A cancer study, a reproduction and a birth

1

Each participant in the MDR was examined by two physicians. 1

In addition to residents' health examinations, investigators tracked down former residents in order to determine the status of their health and the reason for moving. 2

defect study were involved. In addition a health questionnaire was sent to more than 2,000 people who had moved from the areas.

The McGill team consulted and worked with Community Advisory Boards in all three areas. Specifically in the Index Area, the Community Advisory Board had a mandate to comment and endorse the relevance of the work.

The investigators concluded their report on the study with three recommendations:

1. None of the findings in this study can or should be interpreted as a medical or epidemiological justification to relax continuing efforts of industry and government in the control of sour gas emissions and other environmental contaminants. The investigators recommend a sustained policy of strict protection of the environment in Alberta, both in the near term and as a socially responsible long-range plan.

2. To permit valid and reasonably efficient population surveillance or special studies of adverse health events related to reproduction, the investigators recommend that the Province of Alberta promote and fund the upgrading of registration of birth defects. The quality of the resulting Registry of Birth Defects would be similar to the commendable level of quality of the Alberta Cancer Registry. The principles of operation should be mandatory reporting and active surveillance of exposure factors. Its scope should be province-wide. Its system should facilitate inter-provincial comparisons. The initial steps already taken by the University of Calgary in the southern areas of the province should be supported and expanded, with participation of the University of Alberta for full inclusion of northern regions.

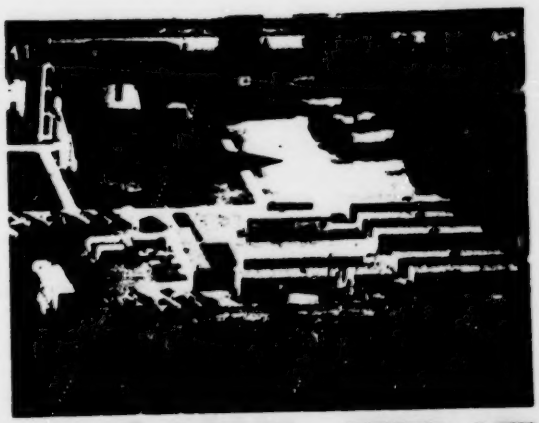
3. Any health study in the Index Area will be affected both by the unavoidably low statistical power for detecting small differences or large proportionate differences in uncommon findings, and selective recall of symptoms or health services. This is inherent in the size of the Index Area population and in the nature of the clinical problems and not resolvable by another study and less so by uniformed "private" impressions. The investigators recommend that further clinical, epidemiologic or demographic studies involving new data collection on the field not be done.

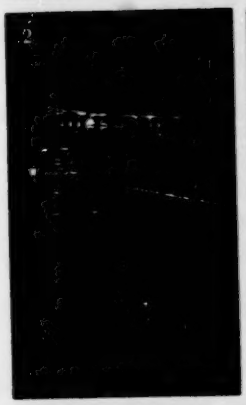
3 Extensive tests of respiratory function were integral to the MDR.

4 Both adults and children underwent a series of health examinations that required more than four hours.

The MDR Research Team

As Principal Investigator, Walter O. Spitzer, M.D., M.P.H., F.R.C.P.(C), Chairman of Epidemiology at McGill and of the Montreal General Hospital's Rapid Response Unit and Strathcona Professor of Preventive Medicine, headed an inter-university and international group of scientists and clinicians. The use of personnel from several organizations was necessary because no one university or research organization has the expertise to tackle such a complex problem within the time frame allocated for the research. The team assembled to do the project, known as the McGill Inter-University Health Research Group, included scientists, consultants and clinicians from North American universities and research groups including the University of British Columbia, the University of Rochester (New York), Laval University, York University, Harvard and Yale.





1 The McGill Inter-University Research Group was headquartered in Hill Spring, Alberta where more than 2,200 residents of the Index Area underwent extensive medical and laboratory testing in the summer of 1985.

2 Hill Spring, Twin Butte, Mountain View, Glenwood and Willow Creek are the southwestern Alberta communities which were the primary focus of the MDR.

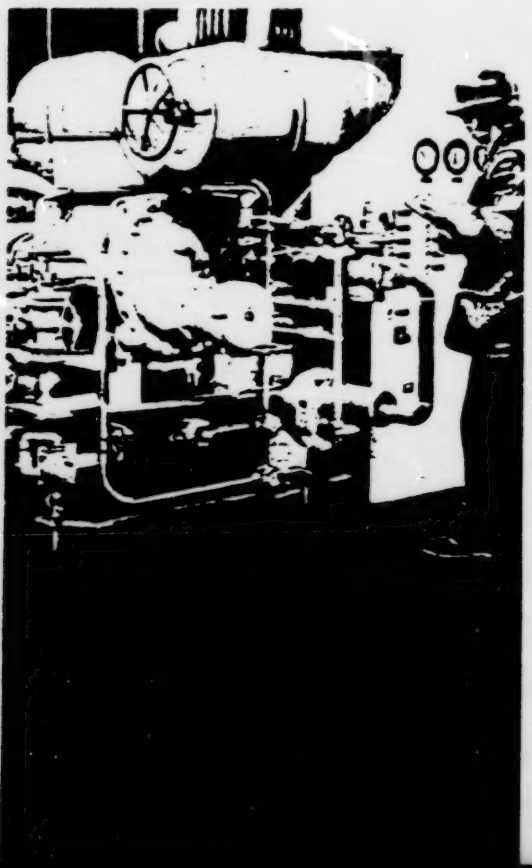
3 MDR Principal Investigator Dr. Walter Spitzer.

4 More than 400 residents from the Index Area attended the public meeting in Pincher Creek to hear the results of the MDR first-hand from the McGill team.

Special Report – Human Health Research

Occupational Health

In November, 1985, the ADRP commissioned a $25,000 feasibility study to determine whether it is possible to do further research into the occupational exposure of sweet gas, sour gas and thermal plant workers in Alberta. The contract was awarded to the Department of Health Services Administration and Community Medicine, Faculty of Medicine, University of Alberta. Principal Investigator was Dr. Tee Guidotti, professor of occupational medicine and head of the department's occupational health program.



The objectives of the feasibility study were to identify the data base available, determine the health outcomes and significant exposures to be addressed in further research, identify constraints and opportunities pertinent to the design of a definitive study, and outline costs, schedule and significance of further research. More than 19 companies, groups and organizations co-operated in the feasibility study.

The University of Alberta researchers recommend a three-stage strategy for this research, spanning a ten-year period, with an estimated budget in the range of $890,000. The researchers propose that the work begin with a pilot study involving establishment of a registry of workers. In general, the main question addressed by the research would be "are there differences in morbidity and mortality patterns in such Alberta workers, and is there an association with exposure factors?" The primary area of research would be in the area of H_2S (hydrogen sulphide). "Knockdowns" would be studied separately.

The conclusion of the feasibility study is that enough data exists to do cost-effective research into the occupational exposure of sweet gas, sour gas and thermal plant workers. The study was presented to the ADRP's Members Committee during the 1986-87 fiscal year. The ADRP has completed a technical review of the study and will be determining research direction in the coming fiscal year.

Special Report – Communications and Public Involvement

As the ADRP anticipated, the availability of research findings would necessitate increased efforts in communications so that the information reaches interested individuals in a form that is understandable. Communications activities during the past year not only focussed on the Medical Diagnostic Review, but also on preparation of research publications related to the biophysical program.

These were among the communications activities of the past fiscal year:

- A public meeting was held on June 11, 1986 in Pincher Creek, at which time the McGill Inter-University Research Group directly provided the community findings on the MDR. A total of 400 people attended. Simultaneously in Crossfield, and the next day in Stirling, both of these comparison communities were provided with results by the investigators. A total of 150 people attended both these meetings.
- Over a three-day period after the main public meeting, the MDR investigators held smaller meetings in the Index Area to allow residents to ask questions about the findings. More than 100 people took advantage of the opportunity.
- The MDR required an intense level of media relations in order to promote understanding of the study findings. Local, provincial, national and international coverage ensued.
- Newsreleases, background materials, and executive summaries were prepared on the MDR, and the research reports were published.
- In October, 1986 members of the McGill team, the Scientific Advisory Board, and the study's Scientific Advisory Group met with about 100 citizens in Edmonton and Calgary to provide more information on the MDR and answer questions related to the study.
- Preparations were made for publication of the biophysical program's world literature reviews. All publications will be registered with the National Library of Canada and have been assigned an ISBN (International Standard Book Number).
- A readership survey was conducted to determine if ADRP materials were useful, and how they could be improved. The survey also updated the mailing list.
- An independent study was commissioned to look at the structure of the ADRP's Public Advisory Board with the aim of strengthening the PAB's role and clarifying its terms of reference and mandate. Recommendations resulting from the study are now being implemented.
- Volume 2, Number 1 of the Update newsletter was published.
- The ADRP continued to participate in numerous conferences, seminars and workshops looking at the question of acid-forming gases.

ADRP Organization

A. Committees

Biophysical Technical Research Committee

Dr. J. Railton
Co-ordinator

Randy Angle
Alberta Environment

Earle Baddaloo
Alberta Environment

Lin Callow
Gulf Canada Resources

David McCoy
Canterra Energy Ltd.

Technical Research Committee Human Health

Dr. Linton Kulak, Chairman
Shell Canada Limited

Dr. Graham Gibbs
Alberta Community and Occupational Health

Dr. Brian O'Connor
Alberta Community and Occupational Health

Dr. Dennis Stokes
Alberta Environment

Communications Committee

Ed Brushett, Chairman

Millard Wright

Dr. Ron R. Wallace

Jean L. Andryiszyn

B. Scientific Advisory Board - Biophysical Research

Biophysical Research

Dr. Sagar V. Krupa
University of Minnesota
(Department of Plant Pathology)
Chairman, Scientific Advisory Board

Dr. James P. Lodge
Consultant in Atmospheric Chemistry
and Editor, Atmospheric Environment

Dr. Robert K. Stevens
U.S. Environmental Protection Agency

Dr. C.M. Bhumralkar
National Oceanographic
and Atmospheric Administration (NOAA)

Bruce B. Hicks
National Oceanographic
and Atmospheric Administration
Atmospheric Turbulence Diffusion
Laboratory (NOAA)

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Iowa State University
Department of Agronomy

Dr. T. Craig Weidensaul
Ohio Agricultural Research
and Development Center
Ohio State University

Dr. Douglas P. Ormrod
University of Guelph
Department of Horticultural Science

Dr. Carl L. Schofield
Cornell University
Department of Natural Resources

Dr. Ron Kickert
Consultant (in modelling)

Dr. Herbert C. Jones
Tennessee Valley Authority
Fisheries and Aquatic Ecology Branch

C. Scientific Advisory Board - Human Health Research

Benjamin Burrows, M.D.
Professor of Internal Medicine
Director
Division of Respiratory Sciences
University of Arizona
Chairman, Scientific Advisory Board

Jonathan M. Samet, M.D.
Associate Professor of Medicine
Department of Medicine
University of New Mexico

Walter Mertz, M.D.
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Human Nutrition Research Center
Agriculture Research Center
U.S. Department of Agriculture

Dr. Zoltan Annau
Professor
Department of Environmental Health Services
The Johns Hopkins University
School of Hygiene and Public Health

Gerry Hill, M.D.
Director
Department of Epidemiology
Alberta Cancer Board
Edmonton, Alberta

Mark J. Utell, M.D.
Associate Professor of Medicine and Toxicology
Co-Director
Pulmonary and Critical Care Unit
University of Rochester School of Medicine

D. Prime Research Contractors

Biophysical Research

Kananaskis Centre for Environmental Research
The University of Calgary

Principal Investigator:
Dr. Allan H. Legge

Medical Diagnostic Review

The McGill Inter-University Research Group

Principal Investigator: Dr. W.O. Spitzer

Occupational Health-Feasibility Study

Department of Health Services Administration and Community Medicine, Faculty of Medicine, University of Alberta

Principal Investigator: Dr. Tee Guidotti

E. Members Public Advisory Board 1986-87

Chairman, Dr. Martha Kostuch
Rocky Mountain House, environmental groups

Dr. Nicholas Bayliss
Edson, health associations

Herman Bulten
Leduc, agricultural community

Donald Tannas
Water Valley, municipal districts

Sophie Taylor
Twin Butte, general public

Dr. John Railton
Calgary, ADRP
Members Committee

Financial Statement

Statement of Operations and Surplus

For the 12 Months from April 1, 1986 to March 31, 1987

	1987
Revenue:	
Surplus, March 31, 1986	$ 5,702
Members	1,154,400
Interest	16,649
	$1,176,751
Expenditures	
Biophysical	967,403
Communications	77,021
Administration	59,348
	$1,103,772
Excess (Deficit) revenue over expenditures for the period and deficit at end of period	**$ 72,979**

Balance Sheet

March 31, 1987

	1987
Assets:	
Current	
Cash and short term deposits	$103,123
Accounts Receivable	113,122
	$216,245
Liabilities and Surplus (Deficit)	
Current	
Accounts Payable	$143,266
Surplus	72,979
	$216,245

Notes to Financial Statements

March 31, 1987

1. Operations and significant accounting policies

The Acid Deposition Research Program was established on January 1, 1983 to perform studies and conduct various workshops and other activities on behalf of its members who are principally companies and organizations operating in the natural resources and energy sectors. The majority of the Program's revenue is derived from, and expenditures are incurred on behalf of, its members.

The financial statements of the Program have been prepared by management in accordance with accounting principles that are considered appropriate for organizations of this nature. The financial statements have, in management's opinion, been properly prepared within reasonable limits of materiality and within the framework of the accounting policies summarized below.

a) Revenue

The Program accounts for revenues using the accrual method of accounting except that interest earned on surplus cash is recognized on the cash basis.

b) Income tax status

The Program is a non-profit organization and as such is exempt from income tax.